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PRODUCTION

FOR MANAGERS OF MANUFACTURING TECHNOLOGY

1988 Capital Spending Survey

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Survey Reactions • TRW Refocuses Efforts in Automotive

JANUARY 1988

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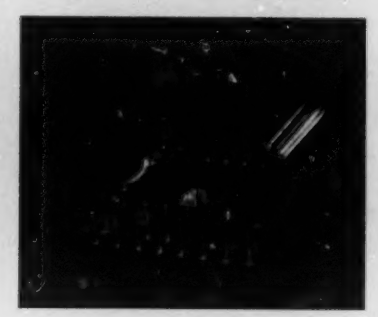

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Capital Spending: The Ascent Begins

PRODUCTION finds a 7.7% increase in spending in 1988. Which is good, considering the doldrums of the past few years. The number-one reason: cost-reduction programs.

*By Edward D. McCallum, Jr.**
Market Research Consultant

**Mr. McCallum, a vice president of Indumar, Inc. (Cincinnati, OH), a marketing research/consulting firm, has conducted the PRODUCTION survey for the past 20 years.*

Comparison of Spending Intentions, 1987 and 1988

Machine/Equipment Type	Percent Total Investment 1988	1987	Total Projection (Million $) 1988	1987	Percent Change 1988/1987
Metalcutting	35.9	38.4	3,160	3,128	+ 1.0
Domestic Sourced	48.0	48.8	1,520	1,528	− 0.5
Offshore Sourced	52.0	51.2	1,640	1,600	+ 2.5
Metalcutting	15.1	12.3	1,330	1,003	+32.6
Domestic Sourced	58.0	57.5	771	577	+33.6
Offshore Sourced	42.0	42.5	559	426	+31.2
Assembly	11.7	14.5	1,030	1,181	−12.8
Other	8.9	5.4	782	440	+77.7
Gaging/Inspection/ Testing	7.9	8.5	694	692	—
Cleaning/Finishing	6.8	6.8	598	554	+ 7.9
Material Handling	5.1	5.1	448	415	+ 8.0
Welding/Riveting/ Brazing	4.1	3.9	360	318	+13.2
Plastic Molding	2.5	2.9	220	236	− 6.8
Heat Processing	1.9	2.0	167	163	+ 2.5

Source: PRODUCTION'S Capital Spending Forecasts 1988/1987.

Spending Profile Based on Plant Size

No. of Employees	Machinery/Equipment Expenditures (Before Adjustment) Median	Average Respondent
Less than 20	$ 50,000	$218,680
20-49	75,000	233,515
50-99	150,000	301,215
100-249	250,000	623,956
250-499	550,000	907,243
500-999	750,000	467,962
1,000-2,499	1,000,000	970,400
2,500 and over	1,000,000	910,806

***Observation:** There is an obvious change in investment intentions reported by respondents for 1988. There is more money reported to be spent in plants employing less than 500 persons while less is reported in plants employing 500 or more. This may reflect current and anticipated capacity need change in the smaller, contract supplier as outsourcing trends accelerate. Concurrently large plants (500 or more employees) anticipate spending more on cleaning/finishing, assembly, gaging/inspection/testing and material handling equipment and less on metalcutting and metalforming machines.*

THERE IS GOOD NEWS. METALWORKing industries* will spend about $8.79 billion this year for production machinery and equipment. This projection follows returns to our 20th annual survey of the spending intentions of plants reached by PRODUCTION Magazine. Much of this improvement is based on the fact that 41.0% of the respondents indicate they expect to increase spending above 1987 levels. Last year, 35.4% said they expected to increase capital spending.

What about Wall Street? This could be the bad news. The gyrations on the stock market commenced *after* we had gathered data and made projections. So we've been asked what the chances are for the forecast to come true. We don't know. But we do know that high levels of employment and personal income have driven the economy—not perceived wealth. We suspect the lids on operating budgets to be clamped shut for the next few quarters, but since capital needs are *considered* needs, we do not foresee a scaling back at this time.

Survey highlights. Major points registered in the survey show:

- Cost reduction continues to be the main reason for machinery and equipment expenditures; it is ranked most important by 40.5% of all respondents.
- The average minimum first year return-on-investment (pre-tax) in justifying new production equipment is 29.0%—the lowest requirement in 10 years. This reflects a slightly larger response from plants employing less than 100 persons where machin-

**Considered for the purpose of this survey to be plants reached by PRODUCTION Magazine in Furniture (SIC 25); Fabricated Metal Products (SIC 34); Machinery, except Electrical (SIC 35); Electrical Machinery (SIC 36); Transportation Equipment (SIC 37); and Instruments (SIC 38).*

1988 figures are projected from 3,219 respondents from 10,000 plants contacted in the survey last August-September, in keeping with past procedures.

Robots: Current and Future Use

	Percent Total Plants Responding
Currently use robots	19.2
Plans for 1988-90 include robot purchases	22.7

Types of Operations For Which Robots Will Be Purchased

Type Operation	Percent of Plants Planning Purchase
Arc Welding	22.6
Spot Welding	9.7
Assembly	42.9
Machine Load/Unload	65.5
Material Handling	29.9
Spray Painting	13.9

Note: Purchase trend is down over last two years:
1987—29.4% planned purchase
1988—34.5% planned purchase

Base: Respondents planning robot purchases 1988-90.

To Last Year's Survey Respondents...

Thank you. Your willingness to share your plant's spending intentions helped us to make projections for 1987 which look like they will be within 5% of what happened. You continue to be good forecasters!

And, to This Year's Survey Respondents...

Your response was the highest in 20 years of surveys. Three-thousand, two-hundred and nineteen of you (out of 10,000) completed and returned their questionnaires. Since we feel there is safety in numbers, we feel confident about the projections you helped us make for 1988.

Thank you very much!

Offshore Purchasing

SIC	Industry	Percent of Total Respondents Planning Offshore Purchases	Percent of Appropriation Going Offshore*
3421	Cutlery	63.6	46.4
3423	Hand and edge tools, except Machine tools and hand saws	43.5	43.5
3429	Hardware, not elsewhere classified	46.9	51.3
3433	Heating equipment except Electric and warm air furnaces	50.0	57.1
3442	Metal doors, sash, frames, molding and trim	57.1	49.4
3451	Screw machine products	56.7	44.3
3452	Bolts, nuts, screws, rivets and washers	50.0	50.3
3462	Iron and steel forgings	64.0	49.1
3469	Metal stampings, not elsewhere classified	41.7	49.4
3471	Electroplating, polishing, anodizing and coloring	57.9	44.5
3479	Coding, engraving and allied services, not elsewhere classified	69.2	38.8
3489	Ordnance and accessories, not elsewhere classified	55.5	51.0
3494	Valves and pipe fittings, except plumbers' brass goods	57.8	42.7
3499	Fabricated metal products, not elsewhere classified	47.1	41.3
3519	Internal combustion engines, not elsewhere classified	78.6	46.4
3523	Farm machinery and equipment	47.4	51.1
3533	Oil field machinery and equipment	66.7	34.6
3541	Machine tools, metal cutting types	51.5	49.7
3544	Special dies and tools, die sets, jigs and fixtures, and industrial molds	41.5	43.2
3545	Machine tool accessories and measuring devices	46.6	50.0
3549	Metalworking machinery, not elsewhere classified	60.0	50.6
3551	Food product machinery	47.4	42.2
3561	Pumps and pumping equipment	56.7	54.8
3566	Speed changers, industrial high speed drives and gears	55.5	44.0
3569	Mechanical powered transmission equipment, not elsewhere classified	45.0	63.9

** Those plants planning offshore purchases.*

(Continued on page 40)

Offshore Purchasing

(Continued from page 39)

SIC	Industry	Percent of Total Respondents Planning Offshore Purchases	Percent of Appropriation Going Offshore*
3573	Electronic computing equipment	68.4	41.1
3585	Air conditioning and warm air heating equipment	50.0	37.2
3599	Machinery, except electrical, not elsewhere classified	45.7	47.6
3651	Radio and television receiving sets, except communication type	57.1	53.7
3662	Radio and television transmitting, signaling, and detection equipment and apparatus	62.9	65.0
3674	Semiconductors and related devices	51.8	43.6
3679	Electronic components, not elsewhere classified	51.1	43.7
3711	Motor vehicles and passenger car bodies	42.3	37.7
3714	Motor vehicle parts and accessories	40.2	33.5
3721	Aircraft	57.9	33.6
3724	Aircraft engines and engine parts	56.3	54.4
3728	Aircraft parts and auxiliary equipment, not elsewhere classified	56.5	38.7
3731	Ship building and repairing	81.8	42.2
382	Measuring and controlling instruments	52.0	42.7
384	Medical, dental and surgical instruments	53.7	42.8
386	Photographic equipment and supplies	55.6	53.2

* *Those plants planning offshore purchases.*

ery/equipment often is purchased without ROI criteria.

• 26.0% of the responding plants, up four percentage points from last year's survey, cite an increase in capacity as their primary spending objective. Most of this activity originates in plants with less than 500 employees that expect to be the beneficiaries of outsourcing policies.

• Operating capacity is reported at 76.7%, up from 75% last year. Expectations are up for 1988, with 59.0% planning to operate at a higher level than 1987, 31.7% at the same level, with only about 5% planning to operate at a lower level. Reasons given: 46.0% report incoming orders on the increase, another 21.2% say incoming orders are steady.

• Of the total dollar projection for 1988 capital expenditures, 69% will be placed with domestic sources with the remaining 31% with offshore sources. That portion of equipment budgets supplied by the domestic equipment builders has stabilized after declining for the last five years. The dollar's decline against other trading partner currencies is the probable reason.

• After a slow start compared to other industries, the use of computers for manufacturing operations in discrete parts industries is taking off. 73.4% of the total respondents report use of computers in manufacturing operations and 52.3% report plans for 1988-90 include purchase, or lease, of computers and software for manufacturing purposes.

• 37% of the respondents report having an approved capital budget at the time of the survey; about half of the remaining 63% expect approvals by year end with the remainder in the first quarter of 1988. Those awaiting budget approval expect to obtain 91%, on average, of what they asked for.

How the money will be spent. As has been the case in each of the 20 surveys conducted, metalcutting machine tools will capture the largest share, 35.9%, of the 1988 capital equipment dollar. That amounts to $3.16 billion and will approximate 1987 order activity.

Metalforming equipment accounts for the second largest item in the investment budget at 15.1%, or $1.33 billion, and continues to show growth as it has for the last two years. Assembly machinery/equipment at 11.7%—$1.03 billion—is next. Gaging/inspection/testing will account for 7.9%; cleaning/finishing equipment, 6.8%; materials handling, 5.1%; welding/riveting/brazing, 4.1%; plastic molding, 2.5%; heat processing, 1.9%. The catchall "other" will take 8.9% of the capital budget and will be up about 75 percent over the 1987 projections.

Technology-intensive Equipment: Steady and Slow

NC/CNC equipment. 62.5% of all respondents report their plant currently operates NC/CNC equipment. Inasmuch as this only represents an

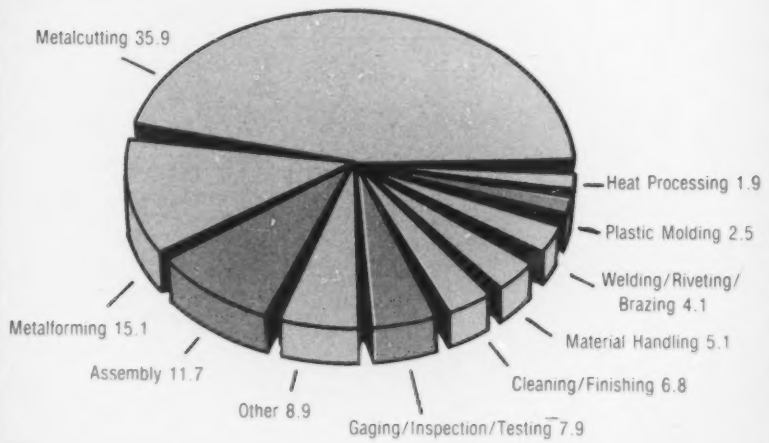
increase of 32% in installations since 1978, it appears that something less than 70% of all plants represents the total user market for CNC equipment. As in past years, horizontal and vertical machining centers and horizontal turning machines account for the largest share of the 46.1% of the plants that plan CNC purchases over the next three years. Grinding, milling and punching will account for most of the remainder.

Flexible manufacturing. Cells and systems continue to be considered options for lowering producer costs. 14.9% of all respondents report their plants currently operate cells; 14.4% indicate they plan to purchase cells over the next three years. (A cell was defined as comprising one materials handling device servicing multiple machines which are coordinated and placed by a computer or programmable controller.) Current and planned use of cells approximate last year's use and planned purchase.

10.5% of the total respondents report they currently operate flexible manufacturing systems (FMSs) for machining, forming or assembly purposes. 11.2% report plans to purchase FMSs in 1988-90. Most of the interest in FMSs stems from plants employing over 250 employees. (For the purpose of definition, a flexible manufacturing system [FMS] is comprised of multiple material handling devices servicing multiple machines with a computer responsible for coordinating, pacing and scheduling.)

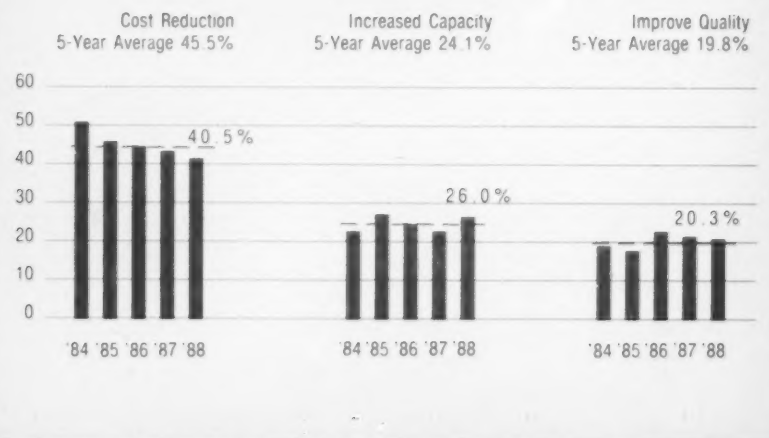
Electrical discharge machines (EDMs). 9.4% of the total respondents plan purchase of EDM equipment over the next three years, down slightly from last year and the year previous. Over 65% of their purchases will originate outside the traditional independent tool and die and mold market (SIC 3544). Better than half of these planned purchases will be accounted for by first-time users. Wire EDM continues to account for the majority of sales with a ratio of 1.5:1.0 over ram (standard) EDM. 20.9% of the total respondents report

How the Capital Equipment Dollar Will Be Spent (%)



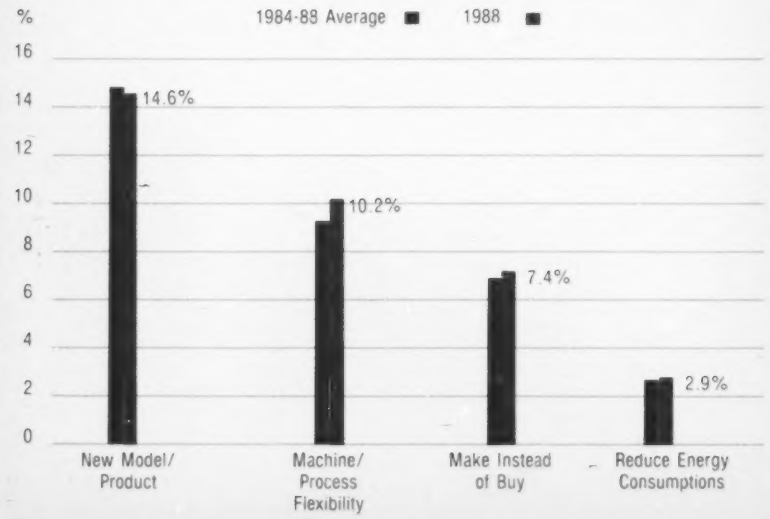
Note: Tan areas indicate increased investment projection in category over last year. To compare changes in projections between 1988 and last year's survey, see "Comparison of Spending Intentions, 1987 and 1988."

The Reasons Behind Equipment Purchases (Total Respondents 1984-1988)



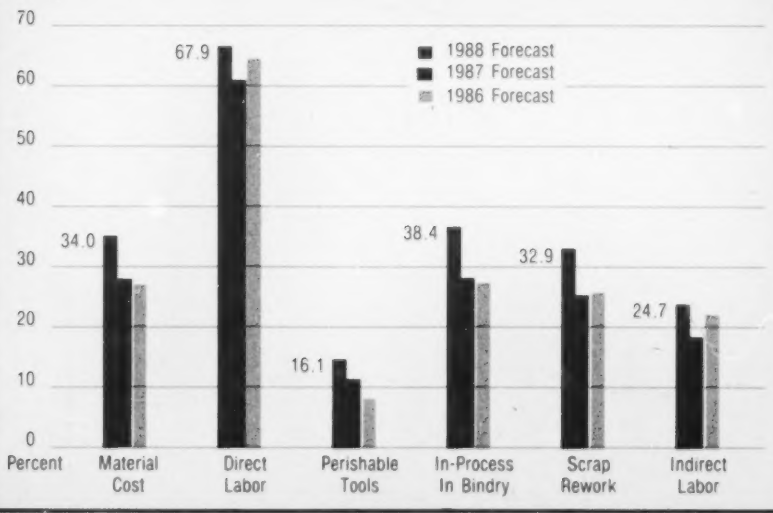
Cost reduction continues to be the number one reason for machinery and equipment purchases. The jump in increased capacity reflects the need in contracting plants to meet outsourcing requirements. The continued emphasis on the need to improve quality was also expected.

Other Motives for Planned Machinery/ Equipment Investments Total Respondent 1984-88



The relative priorities of the "other motives for capital spending" show little change with the following exceptions: machine/process flexibility has increased in importance each year as a motive to purchase new equipment; make instead of buy has trended downward for the past four years until this year when it turned back up reflecting the needs of smaller contract shops to meet the needs of large plant outsourcing.

Primary Cost Targets for Capital Investment (%)



they currently use EDM machines.

Lasers. 11.1% of the total respondents plan to purchase lasers during the next three years. As in past years, laser purchases are originating in medium-sized to large plants—86% of planned buyers are located in plants employing 100 or more persons; 37% in plants employing 500 or more—thus continuing the trend discerned over the last three years. 66.3% of those plants planning laser purchases indicated the types they are interested in. Of these: 46.7% will buy CO_2; 31.9%, YAG; and 27.7%, helium-neon. Planned applications by these buyers are: gaging/measurement, 40.9%; cutting, 39.6%; welding, 24.5%; drilling, 11.1%; heat processing, 4.2%.

Offshore sourcing. On an overall basis, 31% of total capital expenditures for production equipment will be sourced offshore in 1988. This amounts to $2.72 billion. Better than four of 10 (43%) of the total respondents plan to use offshore suppliers for a portion of their equipment needs. This compares to almost 50% of the respondents to last year's survey. Those planning to order offshore will allocate 43.1% of their total capital budgets up slightly from last year's 42%.

60.3% of these respondents plan to buy metalcutting machines; 16.8% metalforming machines and equipment; 14.8% gaging/inspection/testing equipment; 31.0% other types of equipment including assembly, joining, plastic molding, heat processing and material handling equipment.

Quality continues to rank as the number one reason for offshore sourcing and was ranked by 75.7% of the respondents, followed by price (66.7%), availability (39.2%) and service (23.4%). P

For a copy of the Capital Spending Survey Results, please write on company letterhead to "Survey Results," PRODUCTION Magazine, 6600 Clough Pike, Cincinnati, OH 45244-4090.

Spending Patterns

For each of the nine production equipment categories listed, the industries cited are those that account for at least 75% of the planned 1988 investments for that particular type of equipment. Industries not listed do not make significant investments in equipment of that type. Comparing your company's investment plans with your industry is simple. Determine the amounts, by percentage, of total capital expenditures budgeted for each of the equipment categories. Then compare those amounts with the listings.

Heat Processing Equipment

The average respondent company will allocate 1.9% of total investment to heat processing equipment.

SIC	Industry	% of Total Capital Expenditures
342	Cutlery, handtools, hardware	2.3
345	Screw machine products	4.5
346	Metal forgings and stampings	3.2
347	Coating, engraving and allied services	3.7
348	Ordnance and accessories, except vehicles and guided missiles	2.2
352	Farm and garden machinery and equipment	2.5
362	Electrical industrial apparatus	2.4
363	Household appliances	3.8
367	Electrical components and accessories	3.0
371	Motor vehicles, motor vehicle equipment	2.4
372	Aircraft and parts	4.1
375	Motorcycles, bicycles and parts	7.5
376	Guided missiles, space vehicles and parts	9.3
379	Miscellaneous transportation equipment	2.5
384	Surgical, medical and dental instruments and supplies	3.4

Cleaning and Finishing Equipment

The average respondent company will allocate 6.8% of total investment to cleaning and finishing equipment.

SIC	Industry	% of Total Capital Expenditures
341	Metal cans and shipping containers	12.3
342	Cutlery, handtools, hardware	12.3
343	Heating equipment, except electric and warm air; and plumbing fixtures	15.7
344	Fabricated structural metal products	10.0
347	Coating, engraving, and allied services	48.8
352	Farm and garden machinery and equipment	9.1
353	Construction, mining and material handling machinery and equipment	7.5
358	Refrigeration and service industry machinery	9.9
363	Household appliances	9.9
364	Electrical lighting and wiring equipment	9.9
367	Electronic components and accessories	8.0
371	Motor vehicles, motor vehicle equipment	9.0
372	Aircraft and parts	7.6
374	Railroad equipment	8.6
379	Miscellaneous transportation equipment	11.8
383	Optical instruments and lenses	8.6

Metalforming Machinery/Equipment

The average respondent company will allocate 15.1% of total investment to metalforming machinery and equipment.

SIC	Industry	% of Total Capital Expenditures
341	Metal cans and shipping containers	22.7
342	Cutlery, handtools, hardware	19.7
344	Fabricated structural steel products	26.5
346	Metal forgings and stampings	38.1
352	Farm and garden machinery and equipment	26.5
353	Construction, mining and material handling machinery and equipment	15.1
358	Refrigeration and service industry machinery	29.3
361	Electrical transmission and distribution equipment	23.7
363	Household appliances	20.1
364	Electrical lighting and wiring equipment	16.8
371	Motor vehicles, motor vehicle equipment	13.4
374	Railroad equipment	17.5

Material Handling Equipment

The average respondent company will allocate 5.1% of total investment to material handling equipment.

SIC	Industry	% of Total Capital Expenditures
341	Metal cans and shipping containers	13.3
342	Cutlery, handtools, hardware	5.2
343	Heating equipment, except electric and warm air; and plumbing fixtures	8.7
344	Fabricated structural metal products	8.5
352	Farm and garden machinery and equipment	6.4
356	General industrial machinery and equipment	6.0
357	Office, computing and accounting machines	11.4
358	Refrigeration and service industry machinery	6.0
363	Household appliances	7.0
364	Electrical lighting and wiring equipment	7.8
366	Communications equipment	16.3
367	Electronic components and accessories	6.8
369	Miscellaneous electrical machinery, equipment and supplies	6.2
371	Motor vehicles, motor vehicle equipment	7.1
373	Ship and boat building and repairing	19.6
374	Railroad equipment	10.0
376	Guided missiles and space vehicles and parts	6.0
379	Miscellaneous transportation equipment	6.3
383	Optical instruments and lenses	9.3
386	Photographic equipment and supplies	6.7

Assembly Machines/ Equipment

The average respondent company will allocate 11.7% of total investment to assembly machines/equipment.

SIC	Industry	% of Total Capital Expenditures
342	Cutlery, handtools, hardware	14.3
343	Heating equipment, except electric and warm air; and plumbing fixtures	17.4
348	Ordnance and accessories, except vehicles and guided missiles	16.5
357	Office, computing and accounting machines	34.8
361	Electrical transmission and distribution equip.	25.8
362	Electrical industrial apparatus	17.5
363	Household appliances	16.9
364	Electrical lighting and wiring equipment	22.4
365	Radio and TV receiving equipment, except communication types	32.0
366	Communications equip.	30.6
367	Electronic components and accessories	28.1
369	Miscellaneous electrical machinery, equipment and supplies	39.4
371	Motor vehicles, motor vehicle equipment	14.0
374	Railroad equipment	11.8
379	Miscellaneous transportation equipment	20.0
381	Engineering, laboratory, scientific and research instruments and equip.	19.1
382	Measuring and controlling instruments	18.5
384	Surgical, medical and dental instruments and supplies	17.3
387	Watches, clocks, clockwork-operated devices, and parts	50.7

Metalcutting Machine Tools

The average respondent company will allocate 35.9% of total investment to metalcutting machine tools.

SIC	Industry	% of Total Capital Expenditures
345	Screw machine products	55.8
348	Ordnance and accessories, except vehicles and guided missiles	41.5
349	Miscellaneous fabricated metal products	42.8
351	Engines and turbines	57.0
353	Construction, mining and material handling machinery and equipment	45.2
354	Metalworking machinery and equipment	68.3
355	Special industry machinery	60.3
356	General industrial machinery and equipment	48.1
359	Miscellaneous machinery and equipment	71.0
362	Electrical industrial apparatus	30.0
371	Motor vehicles, motor vehicle equipment	29.9
372	Aircraft and parts	52.1
375	Motorcycles, bicycles and parts	43.3
381	Engineering, laboratory, scientific and research instruments and equipment	37.7
382	Measuring and controlling instruments	33.9
383	Optical instruments and lenses	43.6

Plastic Molding Equipment

The average respondent company will allocate 2.5% of total investment to plastic molding equipment.

SIC	Industry	% of Total Capital Expenditures
343	Heating equipment, except electric and warm air; and plumbing fixtures	6.0
347	Coating, engraving and allied services	3.1
349	Miscellaneous fabricated metal products	3.3
352	Farm and garden machinery and equipment	2.6
361	Electrical transmission and distribution equipment	4.5
362	Electrical industrial apparatus	5.0
363	Household appliances	15.0
364	Electrical lighting and wiring equipment	5.5
365	Radio and TV receiving equipment, except communications types	4.8
367	Electronic components and accessories	3.2
369	Miscellaneous electrical machinery, equipment and supplies	3.8
374	Railroad equipment	5.5
381	Engineering, laboratory, scientific and research instruments and equipment	3.4
382	Measuring and controlling instruments	6.6
384	Surgical, medical and dental instruments and supplies	9.6
385	Ophthalmic goods	16.7
386	Photographic equipment and supplies	24.4
387	Watches, clocks, clockwork-operated devices, and parts	15.0

Gaging/Inspection/ Testing Equipment

The average respondent company will allocate 7.9% of total investment to gaging/inspection/testing equipment.

SIC	Industry	% of Total Capital Expenditures
345	Screw machine products	9.7
346	Forgings and stampings	7.3
348	Ordnance and accessories, except vehicles and guided missiles	8.3
351	Engines and turbines	16.0
354	Metalworking machinery and equipment	7.7
356	General industrial machinery and equipment	7.1
357	Office, computing and accounting machines	23.8
361	Electrical transmission and distribution equipment	8.6
362	Electrical industrial apparatus	9.7
365	Radio and TV receiving equipment, except communication types	17.4
366	Communications equipment	17.5
367	Electronic components and accessories	11.6
369	Miscellaneous electrical machinery, equipment and supplies	12.3
371	Motor vehicles, motor vehicle equipment	7.9
372	Aircraft and parts	9.0
374	Railroad equipment	13.4
375	Motorcycles, bicycles and parts	10.0
376	Guided missiles and space vehicles and parts	13.3
382	Measuring and controlling instruments	11.5
383	Optical instruments and lenses	7.9
387	Watches, clocks, clockwork-operated devices, and parts	11.7

Welding/Riveting/Brazing Equipment

The average respondent company will allocate 4.1% of total investment to welding/riveting/brazing equipment.

SIC	Industry	% of Total Capital Expenditures
341	Metal cans and shipping containers	5.3
344	Fabricated structural steel products	11.7
349	Miscellaneous fabricated metal products	4.6
351	Engines and turbines	4.4
352	Farm and garden machinery and equipment	6.9
353	Construction, mining and material handling machinery and equipment	6.5
355	Special industry machinery	6.3
356	General industrial machinery and equipment	5.8
358	Refrigeration and service industry machinery	5.3
361	Electrical transmission and distribution equipment	6.3
363	Household appliances	7.1
364	Electrical lighting and wiring equipment	5.3
371	Motor vehicles, motor vehicle equipment	6.4
373	Ship and boat building and repairing	16.1
374	Railroad equipment	10.5
379	Miscellaneous transportation equipment	18.8
383	Optical instruments and lenses	12.9

Whither Technology?

A new report from the Industrial Technology Institute should give pause to anyone concerned with the reindustrialization of America. Technology isn't catching on like some think that it has.

By Gary S. Vasilash
Senior Editor

THE INTELLIGENT GOOD LOOKS AND quiet demeanor of Edith Wiarda belie the fact that she has what is either extremely good news or bad news for American manufacturers. The enormity of the information seems to require that she be somehow outsized. And as for the spin that one puts on the data: it's like whether the proverbial glass of water is half full or empty.

When we met in the headquarters of the Industrial Technology Institute (ITI), where Wiarda is a researcher in the Industry Affairs and Policy Group, Center for Social and Economic Issues, the building, which could be appropriate for a set on *Star Trek: The Next Generation* (see *Architectural Record,* July 1987, if you're skeptical), was finally having its official dedication.

Michigan governor James Blanchard was bursting with pride, having been in Ann Arbor just a few weeks earlier to announce the fact that the National Center for Manufacturing Sciences had selected the state for its headquarters. Here he was, just a few miles north at ITI, with another major high-tech manufacturing center to talk about. He tells the assembled well wishers that being competitive isn't enough: he's interested in *winning.* Also on the dais is GM chairman and strong ITI supporter Roger B. Smith. He states that "this is a very important day for the U.S. auto industry." With the industry facing its greatest competitive challenge, one that's growing, the combination of advanced technology and skilled workers that ITI is working to develop and promote would be, Smith says, a major positive force.

Which is all true.

However, a few minutes with Wiarda changes opinions about the so-called competitive edge, to say nothing about winning.

Looking at manufacturing. Wiarda was the principal investigator on a study called *Frostbelt Automation: The ITI Status Report on Great Lakes Manufacturing.* The study, performed under a grant from the W.K. Kellogg Foundation, is based on the results of 1,344 telephone interviews conducted between June and September 1986. There were 188 specific questions—yes/no, multiple choice, and short answer—asked of personnel at plants employing 10 or more persons and where manufacturing is the primary function. With regard to establishment size, 523 were of 10 to 49 employees, 494 had 50 to 249 employees, and 327 had 250 or more employees.

Those questioned are all within the U.S. Department of Commerce's definition for durable goods manufacturing, which includes these Standard Industrial Classification (SIC) groups: 24, Lumber and Wood Products; 25, Furniture and Fixtures; 32, Stone, Clay and Glass Products; 33, Primary Metal Industries; 34, Fabricated Metal Products; 35, Non-Electrical Machinery; 36, Electrical and Electronic Machinery; 37, Transportation Equipment; 38, Measuring, Analyzing, and Controlling Instruments; and 39, Miscellaneous Manufacturing Industries. (Note: PRODUCTION's readership closely parallels that list).

The "frostbelt," or Great Lakes region, was considered as Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. These states, in 1982, accounted for 27.8 percent of the nation's durable goods output.

Technology patterns. The survey was interested in the use of 13 technologies—10 "hard" or equipment-based, and three "soft" or software

and people-based. The former are: automated in-process inspection, robots, automated material handling systems, computer-aided design, computer-aided engineering packages, numerically controlled machine tools, computer numerically controlled machine tools, programmable controllers, local area networks, and shop floor microcomputers or personal computers. The "soft" technologies are production planning and inventory control software, statistical process control, and group technology.

The result of this work is what Wiarda calls a "snapshot": an indication of the state of affairs at a particular point in time. The data and some interpretations are collected into two volumes, one dedicated to technology patterns and applications, and the other detailing what is occurring in each of the states. The set of books represents a most valuable working tool for anyone involved in durable goods manufacturing, whether from the standpoint of thinking about where to locate a facility (the amount of skill levels in an area can undoubtedly be determined based on the amount of technology in a state), outsourcing (the amount of technology gives an indication of prime areas to consider), marketing (who needs what and where)...the possibilities are almost endless. There's no other data base like it.

This is but a brief look at some of the information included in the ITI study.

Why so rare? The overall numbers are the most startling. For example, of the 13 technologies, an average of just 2.3 are used by the establishments. The most widely adopted, production planning and inventory control software, was found at 59.4 percent of the facilities. Number two, with 25.9 percent, was SPC. The implementation rate of NC and CNC combined is 24.2 percent. Then the numbers fall into the teens for programmable controllers (17.7 percent), CAD (17.5 percent) group technology (16.4 percent) shop floor PCs (16.1 percent), and local area networks (13.1 percent).

The remaining technologies are very low, with robots at 6.8 percent, computer-aided engineering at 6.6 percent, and automated inspection and automated material handling tied for the basement at 6.5 percent.

Great Lakes Durable Goods Manufacturers Adoption of 13 Advanced Technologies

Technology	Adoption Rate %
Production Planning and Inventory Control Software	59.4
SPC	25.9
CNC*	19.0
Programmable Controllers	17.7
CAD	17.5
Group Technology	16.4
Shop Floor PCs	16.1
Local Area Networks	13.1
NC*	11.9
Robots	6.8
CAE	6.6
Automated Inspection	6.5
Automated Material Handling	6.5

*For NC/CNC combined: implementation rate = 24.2%

Source: *Frostbelt Automation*, Industrial Technology Institute, 1987.

Asked about what she makes of this skew, Wiarda replies, "If you think about the hard technologies—equipment—versus the soft—managerial—it's clear that people tend to be more involved in production planning and inventory control software of some sort, which means anything from running something on a PC to a full-blown MRP system.

"SPC is another of the most commonly cited. I'm of two minds about that. One reason might be that people are starting to recognize that before getting into expensive hardware systems, it makes sense to think about how their organization is managed and to organize the production system." Wiarda adds, "It may be a very hopeful sign that people are doing the managerial work as a precursor—or it could be a reflection of going for lower-cost options and an inability or an unwillingness to spend."

Shallow but potential. In addition to measuring the breadth of technology use in the industries, a yardstick measuring the intensity, or depth, of usage was also established. So while Transportation Equipment scored second in breadth with an average 2.7 technologies employed (only Instruments, SIC 38, was higher with 3.0), its depth was only 11.2 on a scale of zero to 100. It seems as if automotive uses lots of different technologies on an almost experimental basis, which could bode well for its future capabilities.

Big plants boom. With regard to overall technology adoption, the ITI data show that the action is in the plants with 50 to 249 employees and 250 employees and above. The average number of technologies adopted by the former is 3.1 out of 13, while the big plants utilize an average of 5.6 technologies. Of the 13 technologies, big plant adoption leads in all categories, from a high of 86 percent with production planning and inventory control software to 26 percent with automated material handling.

Correlating the big plants and SICs, the Transportation Equipment (SIC 37) 250+ plants lead the way with 6.7 technologies adopted. It's followed by both Non-Electrical Machinery (SIC 35) and Instruments (SIC 38), both of which have adopted 6.2 technologies.

While the figure for overall use of automated inspection—an average 6.5 percent of plants claimed to have it—may be somewhat disconcerting, there is a brighter picture when specific SICs of big plants are examined. For example, in the 250+ plants of SICs 32, 36, 37, and 38 (Stone, Clay and Glass Products; Electrical and Electronic Machinery; Transportation Equipment; and Measuring, Analyzing and Controlling Instruments), the percentages of adoption are 32.4, 35.0, 40.7, and 40.0, respectively. The average for the big plants in all of the durable goods categories covered is 29.7 percent.

Similarly, automated material handling fares well in big plants, with Transportation leading the way with 49.8 percent, followed by Primary Metals (SIC 33) with 35.8 percent and Lumber and Wood Products (SIC 24) with 30.8 percent.

In another field, for example, the report states, "Establishments with more than 250 employees were more than three times as likely to have adopted NC or CNC as those with fewer than 50 employees." (Speaking of technology use in general in the 10 to 49 employee category, Wiarda says, "There's almost a pattern of all or nothing for the smaller guys." She adds, however, "Those who are in it are in it very heavily.")

One simple explanation for the predominance of activity in the big plants can be borrowed from Willie Sutton: "It's where the money is."

In spite of the relative high numbers in the 250+ plants, it is very clear from the report that there are plenty of plants out there in need of technology if they are going to be competitive (and winners), and if some of them are going to serve the domestic auto industry with the quality and price that it requires. This quasi-dearth of technology may be interpreted as a reason to feel poorly about American manufacturing in general (extrapolating from the Great Lakes to the rest of the country) or it can be seen as a tremendous opportunity: Imagine how productive durable goods manufacturing will be once the benefits of manufacturing are realized!

Looking ahead. There's a slight snag on the latter view. Although the survey is, essentially, temporally static (i.e., a point in time), respondents were asked about their plans to buy additional technology within two years. Result: 60.6 percent said no.

However, the good news is that the 250+ plants are bullish. Over all the SICs, 55.4 percent say they plan to get new technologies within two years, with Instruments (SIC 38) leading the way, with 75.4 percent saying yes, and Lumber and Wood Products following close behind at 73.1 percent. The lowest number comes from Fabricated Metal Products (SIC 34), which has 45.4 percent looking at new technologies.

Although statistics are often said to be dubious (as in "Lies, damn lies, and statistics"), one thing is for certain: there is plenty of room for improvement in durable goods manufacturing. P

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